as they now have the form of glacially overdeepened troughs. The greater troughs extend into the maturely dissected area, where they terminate at altitudes of about 400 meters. The earlier view of certain observers that the trough valleys are due to faulting is examined and rejected. Their open floors are more available for travel than the narrow bottoms of the V-shaped valleys, and they serve here and there as sites for the winter villages of the nomadic natives, when the highlands are snow-covered. Certain branch valleys are broadly floored with alluvial deposits, as if they had held temporary lakes while their trunk valleys were occupied by glaciers. On the other hand, several rather extensive intermont basins, occupied by smoothly aggraded alluvial plains, are ascribed to down-faulting and thus are the opposites of the strongly elevated blocks in the lofty ranges.

This valuable article, of which the preceding paragraphs give only a condensed abstract, calls for several comments. It is in the first place pre-eminently intelligible. The landscapes that it describes in outline can be at once visualized with satisfactory definiteness as to their essential qualities. The general concepts thus gained are then elaborated and given quantitative values in order to adapt them to specific instances. This intelligibility, to which the explanatory terminology so largely contributes, is however somewhat obscured by an argumentative manner of presentation on many pages. This manner appears to have been adopted because of the author's well-grounded wish to modify, if not to combat, the conclusions of a number of earlier explorers, some of whom seem to have been little informed as to modern physiographic principles. Such argumentative presentation is a natural characteristic of the developmental stage of an advancing science, when opinions are in a formative state. A more concise form of explanatory presentation will be generally utilized when the majority of explorers reach essential agreement as to the manner of describing land forms; indeed, such conciseness is already adopted by Granö in certain summaries near the close of his article. Had these summaries been placed at the beginning, his readers might have had the enjoyment of following the author's descriptions and discussions while bearing his well-formed conclusions in mind; for, however cautiously and inductively an observer may wish to establish his conclusions, mature and expert readers will be best satisfied if they are told the main conclusions before they read the evidence that leads to them. Geometers have long known and acted on this principle; geographers might profitably adopt it.

A subordinate difficulty in reading the text is the free use of local names, which, although most of them are represented on an outline map, are mentioned without sufficient indication of their position in the region under discussion. Where the matter is so excellent, one must wish that the method should be of a correspondingly high order.

It is only in regard to forms of a special class that the treatment is defective, these are the fault scarps by which the lofty ranges are believed to be limited. In a region that has been recently and rapidly elevated and dislocated, and in which the highest ranges are defined by faults, fault scarps, even though for the most part destroyed by erosion, might still be visible in series of spur-end facets which should stand in simple alignment independent of structure along the base of the ranges. True, one range according to the description of another observer, is said to "rise like a wall"; but mountain-side walls are so battered and breached that fuller description is desirable; and in the case of fault-block ranges observed by Granö himself fuller description might have been advantageously given. This is a small deficiency of an exceptionally valuable essay.

W. M. DAVIS

A SEAMAN IN THE ANTARCTIC

J. K. DAVIS. **With the "Aurora" in the Antarctic, 1911-1914.** xxii and 183 pp.; maps, diagrs., ills., index. Andrew Melrose, London, [1920]. 18 s. 9½ x 7 inches.

Three different methods of exploration have been employed to wrest her secrets from the icebound southern continent. Two of these, dealing with the polar plateau and with land journeys along the coast, have been described in many well-known books. It has remained for Captain John King Davis to tell us of the third in his recent book "With the *Aurora* in the Antarctic."

Here we find the story of his unrivaled oceanographic work in the waters between Australia and Antarctica during the Australasian expedition of 1911–1914. Although in other expeditions valuable results were gained by the exploring vessels during their cruises in

the winter months, none of these equals the work done by the *Aurora*, and none of the masters has hitherto given us more than a summary of his investigations.

An early chapter deals with Macquarie Island, that queer ridge of glaciated rock which may be described as a tile set on edge athwart the wild west winds. All round this dependency of the Commonwealth the *Aurora* made soundings which revealed the profundity of the depths surrounding it. Then we are told of the mysterious Royal Company Isles which were "discovered" in 1776 by a Spanish captain about 400 miles south of Tasmania. Unfortunately for the Spaniard, Davis sailed right across the alleged position of these islands, which must now disappear from the charts. Another interesting chapter deals with the Auckland Isles to the south of New Zealand. We should have liked more particulars of the castaways and settlements which have enlivened the history of these desolate subantarctic islands.

In November, 1912, Davis was dredging 250 miles south of Tasmania when his apparatus was carried away by what may best be described as a crag of a "drowned Tasmania." Rising 8,000 feet above the ocean floor he found a large plateau, "Mill Rise," which raises interesting questions as to a former connection between Australia and Antarctica.

The most vital chapters in the book deal with his hazardous voyages along the icebound coast of Antarctica. The reviewer has spent many months sledging in the Antarctic and has had some slight experience of aviation, but for supreme danger and discomfort he places easily first a cruise among the bergs in the twilight of a polar autumn. Yet this was a commonplace to Captain Davis—the most experienced navigator of Antarctic waters. We read much of the treachery of the famous blizzards. For instance, while waiting to take off Mawson's party at the main base, the *Aurora* was anchored a short distance from the shore. The boats had just taken advantage of a period of calm to land some stores. Suddenly a single terrific gust struck the ship, snapped the anchor chain, and blew the *Aurora* far to the north.

A typical account of the weather describes the day when Mawson was successfully picked up. "At 8 A. M. the land became invisible owing to the driving spray and drift. At 10 A. M. the wind averaged about 70 miles an hour, with squalls of terrific violence. At 11 it reached the strength of a hurricane, the sea was cut off almost flat by the force of the wind. The glass has fallen three-tenths of an inch." We are not surprised that the *Aurora* broke two anchors and lost three others in these tempestuous seas.

Later chapters describe the variations in the ice pack off Antarctica. It is most interesting to know that 1914 was marked by an unusually wide and unbroken belt of pack ice. Is it not possible that this greatly affected the temperature of Australian waters and was a vital factor in determining the great drought of that year? In this section the book is specially well illustrated with sketch maps.

Davis is generous in his praise of the French and American expeditions of 1840. There is a full appreciation of the heroic struggles of Lieutenant Wilkes, Davis following stage by stage the gallant voyages of the sailing ship *Vincennes* in these perilous seas. A series of comparative charts show that the old sailing vessel has rarely been beaten even in these days of steam. We learn that Côte Clairie of the French turns out to have been merely Ice Barrier, for the *Aurora* sailed nearly 100 miles south of this. Here she discovered a new land to which the Australians gave the name of Wilkes Land.

In the last chapter Davis sounds a note of warning: "To the explorer who has not the money to provide good equipment of every kind, my advice is—keep out of the Antarctic!"

GRIFFITH TAYLOR

A TEXTBOOK OF METEOROLOGICAL PHYSICS

W. J. HUMPHREYS. **Physics of the Air.** xi and 665 pp.; maps, diagrs., ills., index. The Franklin Inst. of the State of Pennsylvania. J. B. Lippincott Co., Philadelphia, 1920. $5.00. 9½ x 6½ inches.

The foremost aerographer of Europe in the preface to his "Manual of Meteorology" (1919) said,

"The physical and dynamical principles upon which the processes of weather depend are the common property of all students of physics. If those to whose care the progress of physics is entrusted had taken the physical problems of the atmosphere under their charge as their predecessors did before the advent of the electrical era, one-half at least of this book might have been more effectively dealt with by other hands."